transplantation (HTx). But coronary angiography cannot evaluate microvascular anatomy and function. The purpose of the study was to compare data of coronary angiograms and measurements of endothelium independent coronary flow reserve (FR) by dipyridamole transesophageal echocardiography (TEE) in HTx We studied 22 patients within 12 and 104 months after HTx: 17 with normal coronary arteries (N), 5 with small (<20%) stenosis (S). The control group (C) consisted of 9 healthy subjects. Endomyocardial biopsies and left ventricular mass were normal. All patients underwent TEE within 48 hours of coronary angiography. We used doppler TEE to measure diastolic flow velocity in the proximal part of left anterior descending artery at rest and during dipyridamole intravenous infusion (0.56 mg/Kg in 4 minutes). FR was defined as the ratio of peak flow velocity after dipyridamole to the resting flow velocity. FR was significantly impaired in S group (1.8 ± 0.3) vs C (3.9 ± 0.3, $p < 0.0001$). In N group, 5 patients were explored within 18 months after HTx (3.7 ± 0.6) did not differ with C. Seven patients explored at 84 months had significant lower FR (2.7 ± 0.4) $p = 0.007$ vs C. In N group, patients explored at 18 months had significant higher FR vs those explored at 84 months ($p = 0.001$). There was a negative correlation ($r = -0.58$, $p = 0.01$) between FR and time since HTx. Thus, after HTx, endothelium independent FR seems to be impaired in patients with small stenosis and also progressively impaired with time in patients with normal angiogram. Angiography and assessment of FR by TEE might be complementary in evaluation of graft vasculopathy.

979-164 Insights into the LV Relaxation Process From the Analysis Mitral E Wave Acceleration Time

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Unlike the mitral E/A velocity ratio, the E wave acceleration is a purely early diastolic event and hence we hypothesized that it may be more reflective of the LV relaxation process and the left atrial pressure. This hypothesis was tested in 22 patients undergoing left heart catheterization for clinical indications. The high fidelity LV pressure tracings using Millar catheters and pulsed wave Doppler mitral flow profile were obtained within an hour of each other. The mitral E wave acceleration time was measured from the onset of the E wave to its peak. The LV pressure tracings were analyzed for peak negative dP/dt and Tau by the logarithmic method. Also the LV minimum, end-diastolic, pre-a wave pressure as a reflection of mean left atrial pressure were measured and all these hemodynamic measures were correlated with the E wave acceleration time.

Results: Correlates of mitral E wave acceleration time are summarized in the table below:

	r value	p value
Peak negative dP/dt	0.61	0.0022
Tau	0.74	<0.0001
LV minimum pressure	0.31	0.16
LV pre-a wave pressure	−0.38	0.11
LV end-diastolic pressure	−0.10	−0.67

By multiple regression analysis, the variables listed above accounted for 76% of the variability in the E wave acceleration time (R = 0.87), Tau being its strongest independent determinant.

Conclusions: 1) Doppler derived mitral E wave acceleration time is heavily dependent upon LV negative dP/dt and Tau. 2) It may give valuable insights into the LV relaxation process.

979-165 Accuracy of Transthoracic Echocardiography for the Detection of Inlet Valve Complications in Patients With Left Ventricular Assist Devices

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Left ventricular assist devices (LVAD) are increasingly used in patients with end-stage heart failure (HF) as a long-term bridge to heart transplantation. Thrombus, vegetation or fissuring of the leaflets have been reported at the level of the inlet valve, and their early detection may have therapeutic implications. We assessed the diagnostic accuracy of transthoracic echocardiography in 21 patients (17 M, 4 F, mean age 49 ± 14 years) 74 ± 70 days after LVAD implantation (Thermo Cardiosystems HeartMate 1000 IP pneumatic and HeartMate VE electric). Standard parasternal and apical views were obtained with special focus on the visualization of the cross section of the inlet port. In 15 patients, echocardiographic findings were compared with the visual inspection of the device at the time of explantation. Complications at the inlet valve were detected by echocardiography in 5 patients, or 26% (regurgitation in 4, thrombus in 1); pathology confirmed the findings in all the cases. An additional fissure was seen at explantation in the absence of detectable regurgitation by echocardiography. There was no false positive echocardiography results. Therefore, the sensitivity of echocardiography was 83% (5 of 6), its specificity 100% (9 of 9), and diagnostic accuracy 93% (14 of 15). *Conclusions:* 1) Fissuring of the inlet valve is a frequent complication in long-term LVAD recipients, and can be detected as regurgitant flow by echocardiography. 2) Transthoracic echocardiography is an accurate diagnostic technique for the detection of LVAD inlet abnormalities.

979-166 Size Or Function: Which Correlates Best With Left Atrial Appendage Pathology?

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The left atrial appendage (LAA) is the major intracardiac site of thrombus formation. Both LAA dilation and decreased contractile function occur with atrial fibrillation (AF) which contribute to dense spontaneous echo contrast (SEC) and thrombus formation. Therefore, transthoracic (TTE) followed by transesophageal echo (TEE) was performed in 100 pts; 52 were in AF to evaluate the role of LAA size and function in LAA pathology. We measured 2D LA size (cm^2), LV size and function (FS%), LAA size (cm^2), forward peak (pk) and mean (mn) Doppler flow velocity (cm/sec) and pulmonary vein flows and correlated them with the presence of LAA SEC (faint = 22, dense = 13) and the presence of thrombus (n = 10) found only in AF pts. (*$p < 0.01$)

		FS %	LA-2D	LAA	LAApk	LAAmn
SEC	None	36	19	4.0	63	54
(ALL)	Faint	29	28	7.3	30	22
	Dense	27	29	7.5	18*	14*
Thrombus	+	24	27	7.9	17	13
(AF only)	–	30	28	6.6	35*	25*

While all parameters correlated with presence or absence of SEC, only LAA velocities differentiated faint from dense SEC in all pts, and LAA thrombus in AF pts. Thus, LAA dysfunction is more important than its size in contributing to stasis, dense SEC formation and possible thrombus formation.

980 Heart Rate Variability: Effects of Age/Gender/Disease

Tuesday, March 18, 1997, 9:00 a.m.–11:00 a.m.
Anaheim Convention Center, Hall E
Presentation Hour: 9:00 a.m.–10:00 a.m.

980-142 Independent Autonomic Control of the Sinus Node, AV Node and Ventricular Muscle in Healthy Young men During Sleep

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For healthy young men we have shown that the autonomic modulation of the sinus and AV nodes can be independent. The aim of this study was to investigate, whether ventricular repolarization may also be independently modulated by the autonomic nervous system. In 9 healthy young men (22–26 years), 3 orthogonal ECG leads were online digitized (500 Hz sampling rate) from 10 pm to 6 am during sleep. P waves, QRS complexes and end of the T waves were detected by an autocorrelation algorithm. PR, RR and QT intervals were calculated beat-to-beat with an accuracy of ± 1 ms. After resampling of the PR-, RR- and QT-tachograms, power spectral analysis was performed for consecutive 5 minute intervals using a FFT algorithm. All subjects showed the typical spectral peaks in the low frequency (LF: 0.04–0.15 Hz) and high frequency (HF: 0.15–0.4 Hz) bands for PR, RR and QT. The time course of LF and HF power of PR, RR and QT often showed different patterns in the same patient. Only some segments showed similar trends as might be expected from the known cycle length dependency of AV-conduction and QT duration. In addition, the mean LF/HF ratio for QT (0.75 ± 0.1) was significantly different from the LF/HF ratio of PR (1.7 ± 0.2) and RR (1.8 ± 0.2) indicating differences in the sympatho-vagal balance of modulation at the different anatomic sites.

In conclusion, beat-to-beat measurements of PR, RR (or PP) and QT intervals allow for evaluation of autonomic modulation at different levels of the heart. The different time course of the HF and LF power in PR, RR and QT intervals indicate that changes in RR are not necessarily indicative of the autonomic control of the AV-node and ventricular muscle.